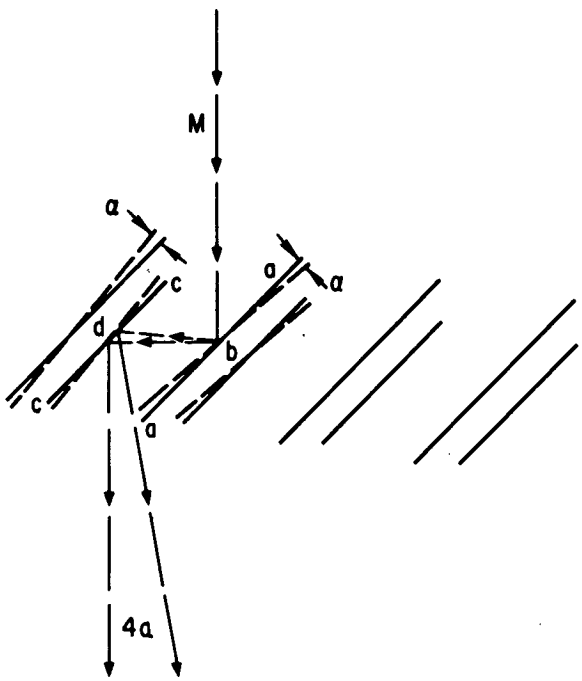
NASA TECH BRIEF

Ames Research Center

Redirecting Electromagnetic Beams through Wide Angles

The commonly used methods for mechanically redirecting an electromagnetic wave generally suffer from combinations of faults related to reduced aperture efficiency and to difficulties in effecting accurate movement of large masses. The arrangement illustrated in the diagram tends to overcome deficiencies in prior art. As indicated in the diagram, an electromagnetic wave, M, enters a reflector array consisting of a grid work of metallic reflectors arranged more or less as a Venetian blind; each reflector obscures a portion of its neighbors so that the incident electromagnetic wave cannot pass directly through the grid.



Wave M is reflected from the upper surface of a-a toward the lower surface of c-c, from which it is reflected again. If a-a is rotated clockwise about its center b through an angle α, the direction of M after reflection from a-a is rotated counterclockwise about its center by an angle 2α; if c-c is rotated counterclockwise about its center d by an angle α, the reflection occuring at c-c is such that an additional rotation of 2α occurs, causing a total rotation of 4α. Thus, the redirected beam is deflected by a large angle for a relatively small angle of deflection of the reflector elements.

The inertial forces involved in moving an antenna constructed as indicated in the diagram are significantly lower than for conventional arrays because of the reduced amplitude of angular motion; moreover, there are internal cancellations of both translational and rotational inertias in the design, and the mass of each element is considerably smaller than the assemblies required for other techniques.

The reflector array indicated in the diagram produces unwanted side lobes because the equal-sized elements act as a diffraction grating. An irregularly-spaced array with elements of gradually decreasing size would perform equally as efficient and would produce little or no side lobes.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

(continued overleaf)

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
Reference: B72-10307

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

Patent Counsel
Mail Code 200-11A
Ames Research Center
Moffett Field, California 94035

Source: John Dimeff, Richard M. Brown, and Masayuki Omura
Ames Research Center
(ARC-10602)